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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/088,706	08/13/2002	Shrre K. Nayar	A32709-PCT USA	2339

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BAKER & BOTTS
30 ROCKEFELLER PLAZA
44TH FLOOR
NEW YORK, NY 10112

EXAMINER	
NGUYEN, LUONG TRUNG	
ART UNIT	**PAPER NUMBER**
2622	

DATE MAILED: 07/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/088,706	NAYAR ET AL.	
	Examiner	Art Unit	
	LUONG T. NGUYEN	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *38-51* is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 August 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. It is noted that this application has been transferred to Examiner Luong T. Nguyen, Art Unit 2622.

2. Applicant's arguments, filed on 4/13/2006, with respect to the Restriction requirement have been fully considered and are persuasive. The Restriction requirement as mailed on 3/27/2006 has been withdrawn. All pending claims 1-51 are examined.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-26, 33-37 are rejected under 35 U.S.C. 102(b) as being anticipated by Nayar (5,760,826).

Regarding claim 1, Nayar discloses a method of acquiring slice image data comprising:

receiving rays over a large field of view in a first direction (reflector 135 receives light, figure 1a, column 5, lines 45-65) and a small imaging width in a second direction (image sensor 110 receives parallel light rays 145, figure 1a, column 5, lines 45-65), at least a portion of said rays being parallel with each other with respect to said second direction;

directing only said portion of said rays upon an area of an imaging sensor (figure 1a, column 5, lines 45-65).

Regarding claim 2, Nayar discloses wherein said directing step includes interposing at least one mirror (reflector 135, figure 1a) and at least one lens (lens 112, figure 1a) between a point where the rays are received and the imaging sensor.

Regarding claim 3, Nayar discloses wherein said directing step distributes said portion of said rays upon the imaging sensor at points corresponding to a plurality of different radial directions of the large field of view (figure 1a).

Regarding claim 4, Nayar discloses the step of interpolating between said points corresponding to a plurality of different radial directions (column 9, lines 5-20).

Regarding claim 5, Nayar discloses sampling the interpolated data over a uniform distribution of said radial direction (column 9, lines 5-20).

Regarding claim 6, Nayar discloses the large field of view is approximately 360 degrees (figure 10).

Regarding claim 7, Nayar discloses the area of the imaging sensor is an annular ring having a radial width (figure 5, column 7, line 62 through column 6, line 20).

Regarding claims 8, 11, 15, Nayar discloses said directing step distributes said portion of said rays throughout the radial width at points corresponding to a plurality of different radial directions of the large field of view (figure 5, column 7, line 62 through column 6, line 20).

Regarding claim 9, Nayar discloses the large field of view is approximately 180 degrees (figure 1a).

Regarding claim 10, Nayar discloses the area of the imaging sensor is a semi-circular annular portion having a radial width (figure 5).

Regarding claim 12, Nayar discloses a method of generating an omnidirectional mosaic image comprising:

acquiring image slice data at a plurality of known rotational positions about an axis of rotation, the image slice data corresponding to an image section having a large field of view along the axis of rotation (figures 9a, column 9, line 55 through column 10, line 22) and a small image width in a second direction, the acquiring step further comprising receiving rays over the large field of view (image sensor 110 receives parallel light rays 145 figure 1a, column 5, lines 45-65), at least a portion of which are substantially parallel in said second direction, and directing only said portion of rays onto at least a portion of an image sensor area (figure 1a, column 5, lines 45-65); and

concatenating the plurality of image slice data using the known rotational positions to form a substantially continuous mosaic image data about the axis of rotation (figures 9a, column 9, line 55 through column 10, line 22).

Regarding claim 13, Nayar discloses the step of mapping the omnidirectional image to a display (figures 1a, 9a, 12, column 10, lines 54-64).

Regarding claim 14, Nayar discloses wherein the large field of view is substantially equal to 360 degrees (figure 10) and wherein the parallel rays are directed on the image sensor in an annular ring pattern having a radial width (figure 5, column 7, line 62 through column 8, line 20).

Regarding claim 16, Nayar discloses the second direction is orthogonal to the axis of rotation and the parallel rays correspond to a planar sheet (figures 8, 12, column10, lines 44-53).

Regarding claim 17, Nayar discloses the second direction is non-orthogonal to the first direction and the parallel rays correspond to a conical sheet (figure 5).

Regarding claim 18, Nayar discloses wherein said directing step is performed using a conical mirror and telecentric lens arrangement (figure 1a , column 5, lines 45-63).

Regarding claim 19, Nayar discloses wherein said directing step is performed using a non-convex mirror in cooperation with an imaging lens (figure 1a , column 5, lines 45-63).

Regarding claim 20, Nayar discloses the step of interpolating between images following the step of concatenation (interpolating image data 1260, figure 12).

Regarding claim 21, Nayar discloses a method of generating an omnidirectionnl mosaic image comprising:

acquiring a plurality of overlapping image strips about an axis of rotation, the image strips having a large field of view along the axis of rotation and a small field of view in a second direction (figure 9a, column 9, line 55 through column 10, line 22);

identifying common features in overlapping regions of consecutive image strips (specifying image view, figure 12, step 1245);

combining consecutive image strips based on the common features to form a substantially continuous omnidirectional image about the axis of rotation (interpolating step 1260, figure 12, column 10, lines 44-67);

blending the combined images in the overlapping regions to provide omnidirectional image data (forming digital image, step 1270, figure 12, column 10, lines 44-67).

Regarding claim 22, Nayar discloses mapping the omnidirectional image data to a display (figure 1a, column 9, lines 10-15).

Regarding claim 23, Nayar discloses wherein said plurality of strips is at least 3 strips (figure 1a).

Regarding claim 24, Nayar discloses a slice camera comprising:

an imaging sensor (image sensor 110, figure 1a, column 5, lines 45-67);

at least one mirror (reflector 135, figure 1a, column 5, lines 45-67) receiving rays over a large field of view in a first direction and a small imaging width in a second direction, at least a portion of said rays being parallel with each other with respect to said second direction;

at least one lens (lens 112, figure 1a, column 5, lines 45-67), the at least one lens receiving the rays from the at least one mirror and directing only said portion of said rays to an area of the imaging sensor.

Regarding claim 25, Nayar discloses the at least one mirror is a conical mirror and said at least one lens is a telecentric lens arrangement (figure 1a).

Regarding claim 26, Nayar discloses the at least one mirror is a non-convex mirror and said at least one lens is an imaging lens having an entrance pupil, said non-convex mirror having a profile such that only said parallel rays are directed through the entrance pupil of the imaging lens and onto the imaging sensor (figure 1a).

Regarding claim 33, Nayar discloses wherein said portion of said rays are directed upon the imaging sensor at points corresponding to a plurality of different radial directions of the large field of view (figure 1a).

Regarding claim 34, Nayar discloses wherein the large field of view is substantially equal to 360 degrees and wherein the area of the imaging sensor is an annular ring having a radial width (figure 5, column 7, line 62 through column 8, line 20).

Regarding claims 35, 37, Nayar discloses wherein said rays are directed throughout the radial width at points corresponding to a plurality of different radial directions of the large field of view (figure 1a).

Regarding claim 36, Nayar discloses wherein the large field of view is a sector less than 360 degrees (figure 1a) and wherein the area of the imaging sensor is a section of an annular ring, corresponding to said sector, and having a radial width (figure 1a).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nayar (US 5,760,826) in view of Braun (US 5,532,737).

Regarding claim 27, Nayar fails to specifically disclose first and second mirrors. However, Braun teaches a camera arrangement with wide field of view, which includes mirror 130 and mirror 160 (figure 3A, column 5, lines 6-48). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device in Nayar by the teaching of Braun in order to avoid the image reversal problem (column 5, lines 45-48).

Regarding claim 28, Braun discloses wherein the second mirror has a near focus and a far focus and wherein the first mirror section projects said portion of rays through the near focus and the second mirror directs said portion of rays to the image sensor located at a position proximate the far focus (figure 3A, column 5, lines 30-48).

Regarding claim 29, Braun discloses the near focus is located in front of the first mirror section and the far focus is located behind the first mirror section (figure 3A).

Regarding claim 30, Nayar and Braun fail to specifically disclose the second mirror is an ellipsoid mirror. However, it is a matter of design choice.

Regarding claim 31, Nayar and Braun fail to specifically disclose the first mirror is a conical mirror and said second minor is a parabolic mirror. However, it is a matter of design choice.

Regarding claim 32, Nayar discloses the imaging sensor is located behind an apex of the conical minor (figure 1a).

Allowable Subject Matter

7. Claims 38-51 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 38, the prior art of the record fails to show or fairly suggest an imaging system for acquiring an omnidirectional mosaic image comprising a rotational drive system operatively coupled to the image slice camera, the rotational drive system rotating the image slice camera along an axis of rotation substantially parallel to the first direction; a control unit operatively coupled to the rotational drive system and image slice camera, the control unit receiving the image slice data from the image slice camera and recording corresponding rotational positional information of the rotational drive system, the control unit acquiring a plurality of image slices at known rotational positions and concatenating said image slices to form an omnidirectional mosaic image data.

Claims 39-51 are allowable for the reason given in claim 38.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUONG T. NGUYEN whose telephone number is (571) 272-7315. The examiner can normally be reached on 7:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID L. OMETZ can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LN
07/09/06

Luong Nguyen

LUONG T. NGUYEN
PATENT EXAMINER